A chemical Analysis of some Calamines. *By* James Smithson, *Esq. F.R.S.* Read November 18, 1802. [*Phil. Trans.* 1803, *p.* 12.]

The uncertainty that has till now prevailed concerning the nature and composition of the ores of zinc called Calamine, has induced our author to enter upon the investigation now before us. In the first part of the paper, we find the analysis of four kinds of calamines; the first from Bleyberg in Carinthia, the second from the Mendip hills in Somersetshire, the third from Derbyshire, and the fourth an electrical calamine from Regbania in Hungary. Referring to the paper for the detail of the four processes there circumstantially described, we must content ourselves with reciting here the results deduced from each of them.

1000 parts of the Bleyberg ore were found to consist of 714 calx of zinc, 135 carbonic acid, and 151 water. Some carbonate of lime and lead were likewise found in it; but these appeared to be mere accidental admixtures, and in too small quantities to deserve notice.

1000 parts of the Mendip ore consisted of 648 parts of calx of zinc, and 352 of carbonic acid, and yielded no water.

In the Derbyshire ore were found 652 of calx of zinc, and 348 of carbonic acid.

And in the Hungarian ore, 683 of calx of zinc, 250 of quartz, 44 water: and here there moreover appeared a loss of 23, owing, no doubt, to some defect in the manipulation. The water was by no means considered as an essential part of this ore; and hence the proportions of the two other ingredients were as 739 to 261.

In a second part of the paper, the author communicates some observations to which he was led by the uncertainty that still prevails in our chemical researches, and the want of uniformity in the results of the multitude of experiments that are daily made, which appear to him to clash essentially with the simplicity of nature. When we consider, he says, the simplicity found in all those parts of nature which are sufficiently known to come within the reach of our observation, it appears improbable that the constituent parts of bodies, which we consider as endowed with reciprocal affinities, should be so loosely united as is often indicated by the most accurate analysis. Hence he is led to conjecture, that in all chemical combinations, those ingredients which are really essential to the compound are but few in number; that they are by nature certain aliquot parts of the whole compound; and that as the aliquot may be expressed by fractions, the denomination of these fractions will always be a small quantity, perhaps never exceeding the number 5.

The author applies this theory to the above-mentioned experiments on calamine; and finding that, with a trifling correction, the results coincide with this theory, he entertains sanguine hopes that future investigations will finally establish it. If so, he thinks that the discovery will introduce in chemistry a rigorous accuracy, of which it has not hitherto been thought susceptible; that it will enable the chemist, like the geometrician, to rectify by calculation the unavoid-

able errors of his manual operations, and authorize him to eliminate from the essential elements of a compound those products of an analysis whose quantity cannot be reduced to any admissible proportion, and may therefore be considered as extraneous.

The author, at the close of his paper, controverts the opinion of those who think that crystallization requires a previous state of solution in the matter crystallized; and contends, that as long as any quantity of fluid is present in a solution, no crystallization can possibly take place.

Experiments on the Quantity of Gases absorbed by Water, at different Temperatures, and under different Pressures. By Mr. William Henry. *Communicated by the Right Hon. Sir* Joseph Banks, *K.B. P.R.S.* Read December 23, 1802. [*Phil. Trans.* 1803, *p.* 29.]

After a short recapitulation of what has of late been done by Mr. Cavendish, Dr. Priestley, Dr. Nooth, and others, respecting the impregnation of water with different gases, our author observes, that the circumstance of the different degrees of temperature and pressure had not been as yet sufficiently attended to. Dr. Priestley, indeed, had long since remarked, that, in an exhausted receiver, Pyrmont water will actually boil at a common temperature, by the copious discharge of its air; and that hence it is very probable, that by means of a condensing engine, water might be much more highly impregnated with the virtues of the Pyrmont spring: but this conjecture remained as yet to be proved by experiments; and this is the task our author has undertaken in the present paper.

This paper consists of two sections; the first treating of the quantities of gases absorbed by water under the usual pressure of the atmosphere; and the second, of the influence of pressure in promoting the absorption of gases. The apparatus contrived for these experiments may be described as a siphon, of which one side, or leg, is a glass vessel of comparatively a considerable diameter, and the other a long glass tube of about a quarter of an inch bore; the junction of these two parts at the bottom being a short pipe of India rubber, well secured by proper integuments of leather, thus forming a joint, which admits of the vessel being briskly agitated. This vessel has a stop-cock both at top and bottom, in order to insert and emit fluids and gases; and both the vessel and tube are accurately graduated. It may now be understood, that a known quantity of water and of a certain gas being put in the vessel, and the tube being filled to a certain extent with mercury, the absorption of the gas will be accurately measured by the column of mercury in the tube. Those who are particularly interested in this inquiry will find in the paper various precautions and additional contrivances, all tending to insure the success and accuracy of the investigation.

The first experiments were made on the absorption of carbonic acid gas by water: and here a singular disagreement was observed in the first trials made under exactly the same circumstances. It